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No. 76—1916.

British Engineering Standards Association.

(Incorporated 1918.)

FORMED IN 1901 AS THE ENGINEERING STANDARDS COMMITTEE
BY
THE INSTITUTION OF CIVIL ENGINEERS.
THE INSTITUTION OF MECHANICAL ENGINEERS.
THE INSTITUTION OF NAVAL ARCHITECTS.
THE IRON AND STEEL INSTITUTE.
THE INSTITUTION OF ELECTRICAL ENGINEERS.

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BRITISH STANDARD NOMENCLATURE OF TARS, PITCHES, BITUMENS AND ASPHALTS,

WHEN USED FOR ROAD PURPOSES

AND

BRITISH STANDARD SPECIFICATIONS FOR TAR AND PITCH

FOR ROAD PURPOSES.

LONDON:
PUBLISHED FOR THE ASSOCIATION BY CROSBY LOCKWOOD & SON,
7, STATIONERS' HALL COURT, LUDGATE HILL, E.C.4; AND 5, BROADWAY, WESTMINSTER, S.W.1;
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May, 1918.

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BRITISH ENGINEERING STANDARDS ASSOCIATION.

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* Succeeded the late Sir John Wolfe Barry, K.C.B., February, 1918.

BRITISH ENGINEERING STANDARDS ASSOCIATION.

The following are lists of Members of the Sectional Committee on Road Material, and of the Sub-Committee on Bituminous Materials, which was entrusted with the drafting of this Report :—

SECTIONAL COMMITTEE ON ROAD MATERIAL.

April, 1916.

Chairman, COLONEL R. E. CROMPTON, C.B.
Road Board, Sir George Gibb ; Mr. E. J. Lovegrove ; *Mr. Frank Staley.
War Office, Lt.-Col. B. H. O. Armstrong, R.E.
Local Government Board (London), Mr. P. M. Crosthwaite.
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Institution of Municipal and County Engineers, Mr. R. J. Thomas ; Mr. E. J. Elford.
Institution of Municipal and County Engineers (Scottish District), Mr. R. Drummond.
Institution of Municipal Engineers, Mr. A. E. Prescott.
County Surveyors' Society, Mr. H. T. Wakelam ; †Mr. T. H. B. Heslop.
Roads Improvement Association, Mr. H. P. Boulnois ; Mr. P. Dodd.
Association of County Surveyors (Ireland), Mr. R. H. Dorman.
Road Surveyors' Association (Scotland), Mr. Allan Stevenson.
Convention of Royal Burghs (Scotland), Mr. Henry S. Keith.
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Royal Automobile Club, Mr. W. Worby Beaumont.
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Commercial Motor Users' Association, Mr. G. Arnold.
United Kingdom Granite and Whinstone Quarry Masters' Association, Mr. G. H. Bragg (North of England) ; Mr. H. J. Grace (Midlands) ; Mr. W. M. Langford (South of England) ; Mr. J. C. Mackay (West of England and Wales) ; ‡Mr. F. W. Manuelle (North of Scotland and Guernsey) ; Mr. J. Stark (West of Scotland).
Leicestershire and District Quarry Masters, Mr. John Ward (Midlands).
Welsh Quarries, Mr. Herbert Beadle (North Wales) ; Mr. C. H. Darbishire (North Wales).
United Kingdom Granite and Whinstone Quarry Masters' Association, Lt.-Col. R. E. Martin (Midlands).
Association of Bituminous and other Paving Materials Manufacturers, Mr. H. D. Blake ; Mr. Herbert W. Robinson.
Mr. W. Howard-Smith ; Mr. H. Wettern.

* Succeeded Mr. H. P. Maybury, January, 1916. † Deceased November, 1915.
‡ Since deceased.

SUB-COMMITTEE ON BITUMINOUS MATERIALS.

April, 1916.

Chairman, COLONEL R. E. CROMPTON, C.B.
Road Board, *Mr. Frank Staley ; Mr. E. J. Lovegrove.
Local Government Board (Scotland), Mr. J. Walker Smith.
National Physical Laboratory, Dr. W. Rosenhain.
Institution of Municipal and County Engineers, Mr. R. J. Thomas.
Institution of Municipal and County Engineers (Scottish District), Mr. R. Drummond.
Roads Improvement Association, Mr. H. P. Boulnois ; Mr. P. Dodd.
Association of Bituminous and other Paving Materials Manufacturers, Mr. H. D. Blake ; Mr. Herbert W. Robinson.
Mr. H. F. Berry ; Mr. Bertram Blount ; Mr. W. J. A. Butterfield ; Mr. T. G. Marriott.

* Succeeded Mr. H. P. Maybury, January, 1916.

PREFACE.

The Sectional Committee on Road Material was appointed at a meeting of the Main Engineering Standards Committee, held on July 18th, 1912. A Sub-Committee to deal with Bituminous Materials was appointed by the Sectional Committee on June 12th, 1913, and met for the first time in October, 1913. A special meeting of the Sectional Committee was held on June 27th, 1913, during the session of the International Road Congress in London. Several of the American Engineers who were present at the Congress attended this meeting by invitation. Their views on the nomenclature for English-speaking nations were obtained, and their co-operation with this Committee was offered and gratefully accepted.

Subsequently the following American Engineers were appointed to correspond with the Committee :—Professor Arthur H. Blanchard (nominated by the Committee of the American Society for Testing Materials on Non-Bituminous Road Materials), Major W. W. Crosby (nominated by the Committee of the American Society of Civil Engineers on Bituminous Materials for Road Construction), and Mr. Prevost Hubbard (nominated by the Committee of the American Society for Testing Materials on the Nomenclature of Bituminous Materials).

The Committee desire to place on record their indebtedness to the American corresponding members for their criticisms, which have been extremely helpful to the Sub-Committee during their deliberations; although, owing to the different standpoint from which the subject has been approached in this country and the United States, the Sub-Committee have not been able to recommend the adoption of the definitions put forward by the American Societies.

The drawing up of definitions for the so-called "bituminous materials" used in road making, on which much confusion now exists, has been felt to be an essential preliminary to the preparation of standard specifications, and the Committee have devoted considerable time and care to the consideration of the exact meanings to be given to the terms Tar, Pitch, Bitumen, Native Bitumen, Asphalt and Native or Rock Asphalt.

It is hoped that the definitions now recommended will go far to prevent the misunderstandings which at present occur in specifying materials belonging to the bitumen and asphaltic group.

This Report was adopted by the Sectional Committee on Road Material at their meeting on January 27th, 1916.

This Report was approved by the Main Committee at their meeting on March 24th, 1916.

R. E. B. CROMPTON,

Chairman of Sectional Committee on Road Material.

BRITISH
STANDARD NOMENCLATURE
OF
TARS, PITCHES, BITUMENS AND ASPHALTS
WHEN USED FOR ROAD PURPOSES.

INTRODUCTORY REMARKS.

The materials now used by Road Engineers for binding together the stones and other mineral aggregate used to form road crusts and road surfaces may be conveniently divided into three groups. These are :—

1. The tars and pitches obtained by the destructive distillation of coal or similar substances.

2. The bitumens and asphalts which are found in nature, or are obtained artificially from asphaltic oils.

3. Chemical binders, including the Portland and natural cements which owe their cementing value as road binders to chemical action, and which are not dealt with in the present report.

Hitherto the term "bituminous material" has been loosely applied to tar products as well as to bitumens and asphalts, but the Committee have from the first considered that it was desirable from the Road Engineers' point of view to maintain a sharp line of demarcation between the two groups. The views put forward in correspondence from America and by American engineers of standing and experience have been carefully considered, but the Committee still adhere strongly to the view that the description "bituminous" should be applied only to the second group.

In this country the first group of road binders, the coal-tars and pitches, have been in use for many years, and as the Road Board in 1911 issued Specifications for the tars, tar oils and pitches, which they recommended for road purposes, these materials have already to some extent been defined by those Specifications. The Road Board early in 1914 issued a second edition of these Specifications. Only two classes of tar, and one class of pitch are dealt with, and as these Specifications are of such recent date, the Committee recommend that they be adopted provisionally as the British Standard Specifications for Tars and Pitches used for Road Work.

The Committee find that the choice of names for the second group of road binders is a matter of some difficulty. This difficulty is increased by the fact that whilst it is desirable to obtain the concurrence of the American Engineers to the nomenclature and definitions which the Committee now propose, the adoption of the American nomenclature for the various materials composing this group would be liable to lead to confusion and misunderstanding in this country.

The Committee have been very anxious to secure uniformity with American practice, and have carefully and fully considered the definitions adopted by the American Society for Testing Materials and by the Committee of the American Society of Civil Engineers, put forward by the American corresponding members, but it is felt that the definitions now decided on are preferable from the Road Engineers' point of view, as they are based on those characteristics of the materials which can be most readily verified when employed for road making.

In accordance with this view the Committee consider that it is desirable to make a sharp distinction between coal tar and paraffin oil derivatives on the one side, and native bituminous substances and asphaltic oil residues on the other, and they are therefore unable to accept the American definition of Bitumen which would include the coal tars.

DEFINITIONS.

FIRST GROUP.

TAR PRODUCTS (PRINCIPALLY COAL TAR AND PITCH).

Definition of Tar.

1. Tar is the matter (freed from water) condensed from the volatile products of the destructive distillation of hydro-carbon matter, whether this be contained in coal, wood, peat, oil, etc.

Prefix denoting source of origin or method of production.

2. A prefix such as "Coal," "Wood," "Peat," "Gas Works," "Blast Furnace," "Coke Oven," etc., must be added to the word "Tar" to indicate the source of origin or method of production.

Definition of Pitch.

3. Pitch is the solid or semi-solid residue from the partial evaporation of tar.

SECOND GROUP.

BITUMENS AND ASPHALTS.

Definition of Bitumen.

4. Bitumen is a generic term for a group of hydro-carbon products soluble in carbon disulphide, which either occur in nature or are obtained by the evaporation of asphaltic oils. The term shall not include residues from paraffin oils or coal tar products.

NOTE.—Commercial materials may be described as **Bitumen** if they contain not less than **98** per cent. of pure Bitumen as defined above.

Definition of Native Bitumen.

5. Native Bitumen is bitumen found in nature, carrying in suspension a variable proportion of mineral matter.

The term "Native Bitumen" shall not be applied to the residuals from the distillation of asphaltic oils.

Definition of Asphalt.

6. Asphalt is a road material consisting of a mixture of bitumen and finely graded mineral matter. The mineral matter may range from an impalpable powder up to material of such a size as will pass through a sieve having square holes of $\frac{1}{4}$ inch side.

Definition of Native or Rock Asphalt.

7. Native or Rock Asphalt is a rock which has been impregnated by nature with bitumen.

Prefixes denoting Source of Origin.

8. The Committee recommend that for convenience of identification prefixes denoting geographically the source of origin should be attached to each of the four terms defined above.

Note.—*The Association desires to call attention to the fact that these Specifications are intended to include the technical provisions necessary for the supply of the material herein referred to, but do not purport to include all the necessary provisions of a Contract.*

BRITISH STANDARD SPECIFICATIONS FOR TAR FOR ROAD PURPOSES.

(Based upon the Road Board Specifications Nos. 4 and 5 and published with the approval of the Road Board.)

Standard Tar for Road purposes in the United Kingdom shall be specified as under:

BRITISH STANDARD SPECIFICATION FOR No. 1 TAR.

General.

1. This tar is suitable for the surface tarring of roads.

As to the use of this tar for making tar macadam, see "Road Board General Directions for Surfacing with Tar Macadam."

Heating.

2. The tar should be heated to such a temperature that it will reach the road surface in a highly fluid condition. The necessary temperature to attain this end will vary with the mode of application of the tar. The tar should be heated in a heater or "boiler" specially designed to prevent frothing, which will otherwise inevitably occur if the tar contains even a small percentage of water. The desired temperature will generally be found in practice to be between 220° and 240° Fahrenheit or 104° and 116° Centigrade in the heater or boiler.

Source of the Tar.

3. The tar shall be derived wholly from the carbonization of coal, except that it may contain not more than 10 per cent. of its volume of the tar (or distillates or pitch therefrom) produced in the manufacture of carburetted water gas.

Specific Gravity.

4. The specific gravity of the tar at 15° Centigrade (59° Fahrenheit) shall be as nearly as possible 1·19, and in no case shall it be lower than 1·16 or higher than 1·22.

Freedom from Water and Ammonia.

5. The tar shall be commercially free from water, *i.e.*, it shall not contain more than 1 per cent. by volume of water or ammoniacal liquor, which water or liquor (if present) shall not contain more ammonia, free or combined as carbonate or sulphide than corresponds to 5 grains of ammonia per gallon (= 70 milligrammes per litre) of the tar.

The amount of water or liquor is to be determined by condensation from the products of distillation of the tar by cooling with a cold water condenser. Any water so condensed, after measurement, should be separated from light oils which may have condensed with it, and the amount of ammonia in it should be estimated by direct titration with Standard acid. The amount of ammonia thus determined should be calculated in terms of grains of ammonia per gallon of tar.

Fractionation.

6. On distillation in a litre fractionating flask (a distillation flask without special fractionating column) one-half to two-thirds filled the tar shall yield the proportions by weight of distillates stated below; the temperatures of distillation being read on a thermometer of which the bulb is opposite the side tube of the flask:—

Below 170° Centigrade or 338° Fahrenheit, not more than 1 per cent. of distillate (light oils), exclusive of water.

Between 170° and 270° Centigrade or 338° and 518° Fahrenheit, not less than 16 per cent. and not more than 26 per cent. of distillate (middle oil).

Between 270° and 300° Centigrade or 518° and 572° Fahrenheit, not less than 3 per cent. and not more than 10 per cent. of distillate (heavy oils).

The total distillate between 170° and 300° Centigrade, or 338° and 572° Fahrenheit, shall be not less than 24 per cent. and not more than 34 per cent. *i.e.*, where the middle oils approach the maximum allowed, the heavy oils should approach the minimum allowed and *vice versa*.

Napthalene.

7. The distillate between 170° and 270° Centigrade, or 338° and 518° Fahrenheit (middle oils), shall remain clear and free from solid matter (crystals of naphthalene, &c.) when maintained at a temperature of 30° Centigrade for half an hour.

This requirement may be waived in the case of tar supplied direct from gas works, but the tar from which the naphthalene has been extracted is preferable to tar containing much naphthalene).

Phenols.

8. The distillate between 170° and 270° Centigrade or 338° and 518° Fahrenheit (middle oils), shall not yield to caustic soda solution more crude tar acids (phenols), than is equivalent to 3 per cent. by volume of the tar.

The following is the standard method of estimating the crude tar acids :—

Warm the middle oils to about 30° C. in a measuring cylinder. Weigh a flask of about 150 c.c. capacity ; pour 100 c.c. of the warm middle oils into it, and weigh again. The difference gives the weight of 100 c.c. of the middle oils. Warm the oils in the flask to 40°-50° C. ; add to them 30 c.c. of solution of caustic soda, having a specific gravity of about 1·2, shake the mixture vigorously and keep it at 40°-50° C. for 15 minutes. Then shake the mixture again vigorously for a minute, pour it into a stoppered separating funnel, and allow it to rest therein until the solution of caustic soda has separated from the oil. If the separation does not take place rapidly and distinctly it may be facilitated by adding 25 c.c. of benzol to the mixture. The soda solution free from oil is drawn off through the tap of the funnel into a 100 c.c. measuring cylinder, and the oil is returned to the flask, and warmed and extracted with 20 c.c. of solution of caustic soda exactly as before. This soda solution is also drawn off into the 100 c.c. measuring cylinder, the contents of which are made slightly acid by gradual addition, with gentle stirring, of hydrochloric acid. The crude tar acids separate and come to the top on standing, and their volume is read off on the scale of the measure. Since 100 c.c of the middle oils was taken for the estimation, the reading gives directly the percentage of crude tar acids in the middle oils.

If n = volume of tar acids found, w = the weight in grammes of 100 c.c. of the middle oils, x = the percentage (by weight) of middle oils in the tar, and s = the specific gravity of the tar, then the percentage by volume of crude tar acids in the tar is $\frac{n x s}{w}$.

If 100 c.c. of middle oils is not available for estimation, a smaller measured volume may be taken, and the quantities of soda solution used reduced in proportion. The necessary modification of the calculation of the result can be readily made.

Free Carbon.

9. The tar shall contain not less than 12 per cent. and not more than 21 per cent. by weight of free carbon. The free carbon is to be determined by the weight of the residue after complete extraction of all matter soluble in benzol or disulphide of carbon. The extraction is best carried out in a Soxhlet or similar apparatus by disulphide of carbon followed by benzol.

BRITISH STANDARD SPECIFICATION FOR No. 2 TAR.

General.

1. This tar is suitable for making tar macadam, and also may be used for surface tarring in very hot weather when the road crust is exceptionally dry.

Heating.

2. For surface tarring, the tar should be heated to such a temperature that it will reach the road surface in a highly fluid condition. The necessary temperature to attain this end will vary with the mode of application of the Tar. The desired temperature will be generally found in practice to be between 260 and 280 Fahrenheit or 124° and 138° Centigrade in the heater or "boiler." The tar should be heated in a heater or "boiler" specially designed to prevent frothing, which will otherwise inevitably occur if the tar contains even a small percentage of water. For the preparation of tar macadam the tar will not generally need to be heated to so high a temperature as for surface tarring, but the necessary temperature should be determined largely by the sensible heat of the stone treated with the tar, and the mode of application or treatment.

Source of the Tar.

3. The tar shall be derived wholly from the carbonization of coal, except that it may contain not more than 25 per cent. of its volume of the tar (or distillates or pitch therefrom) produced in the manufacture of carburetted water gas.

Specific Gravity.

4. The specific gravity of the tar at 15° Centigrade (59° Fahrenheit) shall be as nearly as possible 1·21, and in no case shall it be lower than 1·19 or higher than 1·24.

Fractionation.

5. On distillation in a litre fractionating flask (a distillation flask without special fractionating column) one-half to two-thirds filled, the tar should yield the proportions by weight of distillates stated below: the temperatures of distillation being read on a thermometer of which the bulb is opposite the side tube of the flask:—

Below 170° Centigrade or 338° Fahrenheit, not more than 1 per cent. of distillate (light oils and water, if any).

Between 170 and 270 Centigrade or 338 and 518 Fahrenheit, not less than 12 per cent. and not more than 18 per cent. of distillate (middle oils).

Between 270° and 300° Centigrade or 518° and 572° Fahrenheit, not less than 6 per cent. and not more than 10 per cent. of distillate (heavy oils).

The total distillate between 170° and 300° Centigrade, or 338° and 572° Fahrenheit, shall not be less than 21 per cent. and not more than 26 per cent., *i.e.*, where the middle oils approach the maximum allowed the heavy oils should approach the minimum allowed and *vice versa*.

Naphthalene.

6. The distillate between 170° and 270° Centigrade, or 338° and 518° Fahrenheit (middle oils), shall remain clear and free from solid matter (crystals of naphthalene, &c.) when maintained at a temperature of 25° Centigrade for half an hour.

Phenols.

7. The distillate between 170° and 270° Centigrade, or 338° and 518° Fahrenheit (middle oils), shall not yield to caustic soda solution more crude tar acids (phenols) than is equivalent to 2 per cent. by volume of the tar.

The following is the standard method of estimating the crude tar acids: —

Warm the middle oils to about 30° C. in a measuring cylinder. Weigh a flask of about 150 c.c. capacity; pour 100 c.c. of the warm middle oils into it and weigh again. The difference gives the weight of 100 c.c. of the middle oils. Warm the oils in the flask to 40°-50° C.; add to them 30 c.c. of solution of caustic soda, having a specific gravity of about 1·2, shake the mixture vigorously and keep it at 40°-50° C. for 15 minutes. Then shake the mixture again vigorously for a minute, pour it into a stoppered separating funnel, and allow it to rest therein until the solution of caustic soda has separated from the oil. If the separation does not take place rapidly and distinctly, it may be facilitated by adding 25 c.c. of benzol to the mixture. The soda solution free from oil is drawn off through the tap of the funnel into a 100 c.c. measuring cylinder, and the oil is returned to the flask, and warmed and extracted by 20 c.c. of solution of caustic soda exactly as before. This soda solution is also drawn off into the 100 c.c. measuring cylinder, the contents of which are made slightly acid by gradual addition, with gentle stirring, of hydrochloric acid. The crude tar acids separate and come to the top on standing, and their volume is read off on the scale of the measure. Since 100 c.c. of the middle oils was taken for the estimation, the reading gives directly the percentage of crude tar acids in the middle oils.

If n = volume of tar acids found, w = the weight in grammes of 100 c.c. of the middle oils, x = the percentage (by weight) of middle oils in the tar, and s = the specific gravity of the tar, then the percentage by volume of crude tar acids in the tar is $\frac{n\,x\,s}{w}$.

If 100 c.c. of middle oils is not available for the estimation a smaller measured volume may be taken, and the quantities of soda solution used reduced in proportion. The necessary modification of the calculation of the result can be readily made.

Free Carbon.

8. The tar shall contain not less than 12 per cent. and not more than 22 per cent. by weight of free carbon. The free carbon is to be determined by the weight of the residue after complete extraction of all matter soluble in benzol or disulphide of carbon. The extraction is best carried out in a Soxhlet or similar apparatus by disulphide of carbon followed by benzol.

THE TESTING OF TAR.

The compliance of a sample of tar with the British Standard Specifications for No. 1 and No. 2 Tars can be ascertained only in a chemical laboratory. But in cases where it is desired to ascertain in a quick and simple manner whether consignments of tar differ fundamentally from an approved sample, or whether they are of the No. 1 or of the No. 2 grade, the following simple tests may be of service :—

(1) *Specific Gravity.*—The specific gravity may be ascertained quickly and with a sufficient degree of accuracy by means of a hydrometer, to the readings of which a correction for deviation of temperature from the standard temperature of 15° Centigrade or 59° Fahrenheit is applied. A hydrometer for the range 1·16–1·24, which is wholly made in Nickel Silver, and will stand a reasonable amount of rough usage, is convenient, and this may be obtained in conjunction with a temperature corrector consisting of a substantial thermometer graduated to show directly the addition which should be made to the hydrometer reading when the temperature of the tar is above 15° Centigrade or 59° Fahrenheit. If a portion of the tar is poured into a suitable vessel, stirred, and the metal hydrometer and temperature corrector inserted in it, the specific gravity of the tar at 15° Centigrade or 59° Fahrenheit is obtained in two or three minutes, even though the temperature of the tar at the time is considerably higher than 15° Centigrade or 59° Fahrenheit.

The specific gravity of a tar is not by itself a sufficient indication of the utility of the tar.

(2) *Viscosity.*—A viscosimeter will show quickly whether a sample of tar is of the No. 1 or of the No. 2 grade, or whether a consignment differs fundamentally from an approved sample, but since viscosity of tar varies greatly with its temperature, it is

necessary that readings of viscosity, in order to be comparable, should be made at the same temperature. The temperature of 25° Centigrade (77° Fahrenheit) is a convenient standard temperature for observations of the viscosity of tar, and it is necessary before using the viscosimeter that the tar should be exactly at this temperature and well stirred. In cases where serious disagreement is found between the viscosity of an approved sample and the viscosity of the tar as supplied, further examination of the latter should be made before it is used.

(3) *Water and Naphthalene.*—If about a quart of the tar is poured into a vessel about 12 inches high, and the vessel is covered by a piece of ordinary glass, and is left standing in a moderately warm room for 24 hours, flaky white crystals of naphthalene will be seen on the glass, and the upper part of the walls of the vessel, if there is a considerable amount of naphthalene in the tar. Globules of water also will be noticeable on the surface of the tar at the end of 24 hours if the tar contains a considerable quantity of water. Since most tars contain some naphthalene and often a trace of water also, it is advisable when making this test to put alongside the portion of tar which is being tested a portion of the approved sample in a similar glass covered vessel, and to compare the amount of naphthalene crystals deposited and of water separated from the two samples at the end of 24 hours.

Note.—The Attention of Contractors is drawn to the fact that this Specification is intended to include the technical provisions necessary for the supply of the material herein referred to but does not purport to include all the necessary provisions of a Contract.

BRITISH STANDARD SPECIFICATION FOR PITCH FOR ROAD PURPOSES.

(*Based upon the Road Board Specification No. 6 and published with the approval of the Road Board.*)

Standard Pitch for Road Purposes in the United Kingdom shall be specified as under :—

BRITISH STANDARD SPECIFICATION FOR PITCH.

General.

1. This pitch is suitable for pitch-grouting. See "Road Board General Directions for Pitch-Grouting."

Consistency.

2. The pitch is obtained of the required consistency most conveniently by running it off from tar stills in which the distillation of the tar has been stopped at the point at which the residual pitch will give a penetration of 70 (or such other penetration as may be specified to suit climatic or local conditions) when tested at 25° Centigrade (77° Fahrenheit) on a penetrometer. Harder pitch may be softened or cut back, in the still or in a mixer at the tar works, to the extent necessary for it to give this penetration, by the addition of tar oil of the grade specified below in Clauses 7 to 10.

Where pitch of the required consistency is not thus directly procurable, it may be prepared by softening commercial soft pitch, as specified below in Clauses 4 to 6, by the addition of tar oil as specified below in Clauses 7 to 10. In preparing the softened pitch in this manner the tar oil is added to the pitch in the manner described under "Instructions for Melting the Pitch" in the "Road Board General Directions for Surfacing with Pitch-Grouted Macadam," in such proportions that the resultant softened pitch will give a penetration of 70 (or such other penetration as may be specified to suit climatic or local conditions) when tested at 25° Centigrade (77° Fahrenheit) on a penetrometer, with a No. 2 needle weighted to 100 grammes for five seconds.

PREPARED PITCH FROM TAR DISTILLERIES.

General Characteristics.

3. Pitch which has been procured of the required consistency directly from a tar distillery needs only to be thoroughly melted in the pitch heaters or boilers, but as a precaution against burning, 1 to 2 per cent. of tar oil may advantageously be put into the boilers with the pitch.

Pitch which has been procured of the required consistency directly from a tar distillery shall not yield more than 4 per cent. of distillate below 270° Centigrade, or 518° Fahrenheit, on distillation as described below in Clause 5, and shall contain not less than 16 per cent. and not more than 28 per cent. of "free carbon," as defined below in Clause 6.

COMMERCIAL SOFT PITCH.

Source of Pitch.

4. The pitch shall be derived wholly from tar produced in the carbonization of coal, except that it may contain not more than 25 per cent. of pitch derived from tar produced in the manufacture of carburetted water gas.

Fractionation.

5. On distillation in a litre fractionating flask (a distillation flask without special fractionating column) one-half to two-thirds filled, the pitch shall yield the proportions by weight of distillates stated below: the temperatures of distillation being read on a thermometer of which the bulb is opposite the side tube of the flask:—

Below 270° Centigrade or 518° Fahrenheit, not more than 1 per cent. of distillate.

Between 270° and 315° Centigrade or 518° and 599 Fahrenheit, not less than 2 per cent. and not more than 5 per cent. of distillate.

Free Carbon.

6. The pitch shall contain not less than 18 per cent. and not more than 31 per cent. by weight of free carbon. The free carbon is to be determined by the weight of the residue after complete extraction of all matter soluble in benzol or disulphide of carbon. The extraction is best carried out in a Soxhlet or similar apparatus by disulphide of carbon followed by benzol.

TAR OIL.

Source of Tar Oil.

7. Tar oil to be used is preferably a filtered green or anthracene oil, and shall be derived wholly from tar produced in the carbonization of coal or from such tar mixed with not more than 25 per cent. of its volume of tar produced in the manufacture of carburetted water gas.

Specific Gravity.

8. The specific gravity of the tar oil at 20° Centigrade (68° Fahrenheit) shall lie between 1·065 and 1·085.

Freedom from Naphthalene and Anthracene.

9. The tar oil after standing for half an hour at 20° Centigrade (68° Fahrenheit) shall remain clear and free from solid matter (naphthalene, anthracene, &c.).

Fractionation.

10. The tar oil shall be commercially free from light oils and water. On distillation in a litre fractionating flask (a distillation flask without special fractionating column) one-half to two-thirds filled, the tar oil shall yield the proportions by weight of distillates stated below; the temperatures of distillation being read on a thermometer of which the bulb is opposite the side tube of the flask:—

Below 170° Centigrade or 338° Fahrenheit, not more than 1 per cent. of distillate (light oils and water, if any).

Below 270° Centigrade or 518° Fahrenheit, not more than 30 per cent. of distillate (middle oils, and light oils and water, if any).

Below 330° Centigrade or 626° Fahrenheit, not less than 95 per cent. of distillate (heavy oils, middle oils, and light oils and water, if any).

British Engineering Standards Association.

PRICE LIST

OF

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NOVEMBER, 1918.

(This List cancels all previous Lists.)

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